Workshop for standards developers and editors

Julian Fowler (PDT Solutions)
Thomas L. Warren (Oklahoma State University)

- Standards communicate to identified target users a technical specification that is unambiguous to the extent that two parties who
  - have not taken part in developing the standard, and
  - are not working together
- can create implementations of the standard (normally software) that conform to the stated requirements of the standard and are mutually consistent.

Agenda

- Introduction
- Part 1: Procedures and directives:
  - ISO Directives
  - SC4 Supplementary Directives
  - Checklists
  - Review, approval, and signoff procedures
- *break*

ISO TC184/SC4 Quality Committee

Agenda (continued)

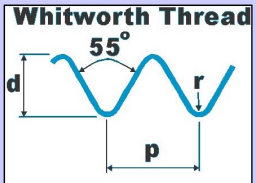
- Part 2: Drafting a standard
  - Writing guidance for authors and editors
  - Understanding the needs of readers
  - Definitions and how to write them
- Question and answer session
- Close

Procedures and directives

- What are the key tasks and milestones in developing and publishing a standard?
- What documents do we need?
- What procedures do we follow?
- How do we write a standard?

Introduction to ISO standardization

- Standardization is a product of the industrial revolution
- Driven by needs for:
  - interchangability
  - efficiency
  - "supply chain management"
- Early example:
  - Standard for screw threads developed by Sir Joseph Whitworth (right) in 1848

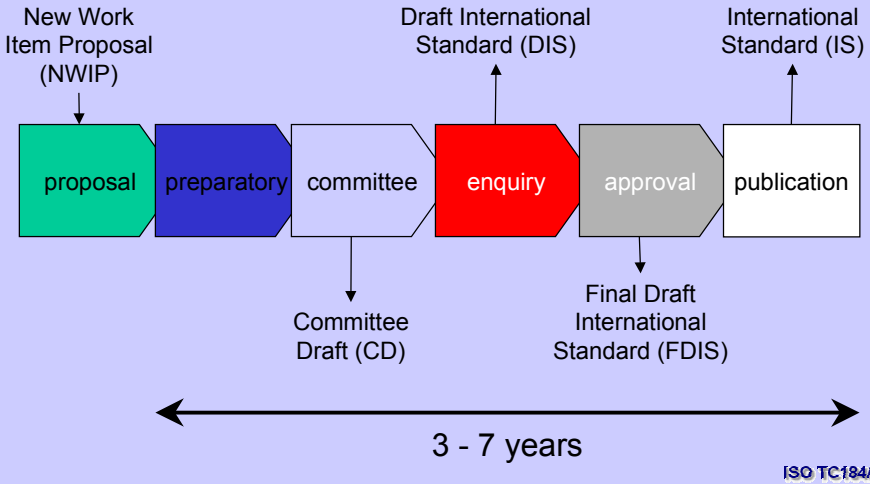


Still in use today:
- ISO 68-2
- ISO 263
- ISO 5864

Drivers for international standardization

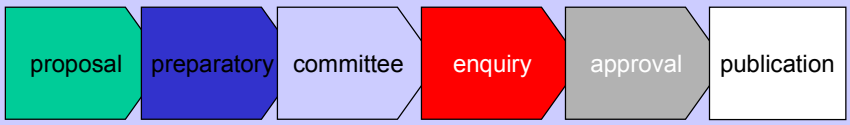
- Worldwide progress in trade liberalization
- Interpenetration of sectors
- Worldwide communications systems
- Global standards for emerging technologies
- Developing countries

Developing international standards



Faster development processes

mature specifications (national, industry) can be “fast tracked”



interim documents can be published as ISO Technical Specifications

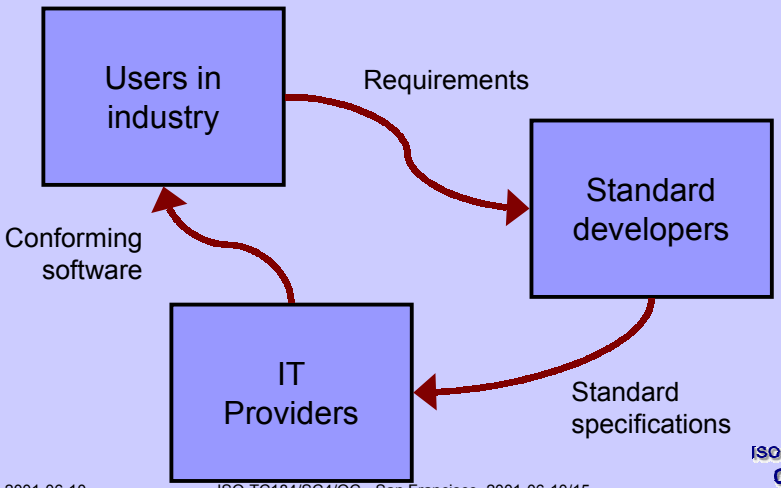
Key tasks and milestones

- Prepare and submit a New Work Item Proposal
- Develop a series (one or more) of Working Drafts
- Review working drafts
  - team reviews
  - industrial reviews
  - peer reviews in SC4

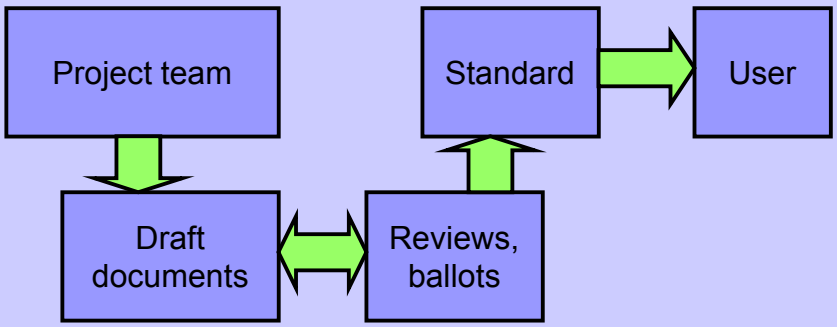
Key tasks and milestone (continued)

- Prepare and submit document for Committee Draft (CD) ballot
  - to establish that **consensus** exists with respect to the technical content of the standard
- Prepare and submit document for Draft International Standard (DIS) ballot
  - to gain **approval** for publication of the standard

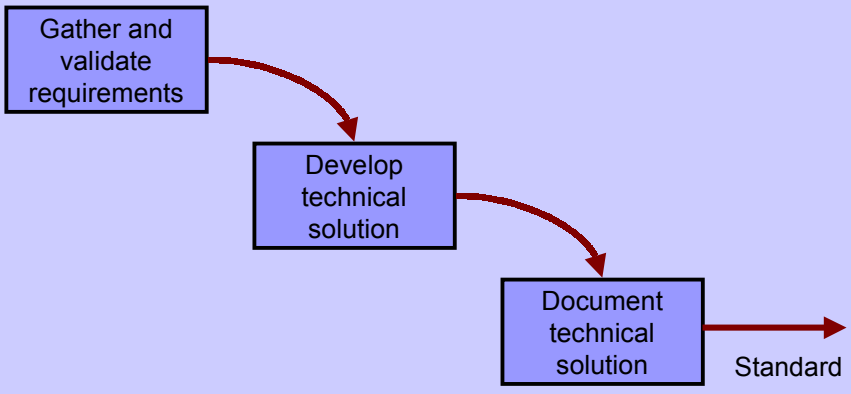
SC4 development process (View #1)



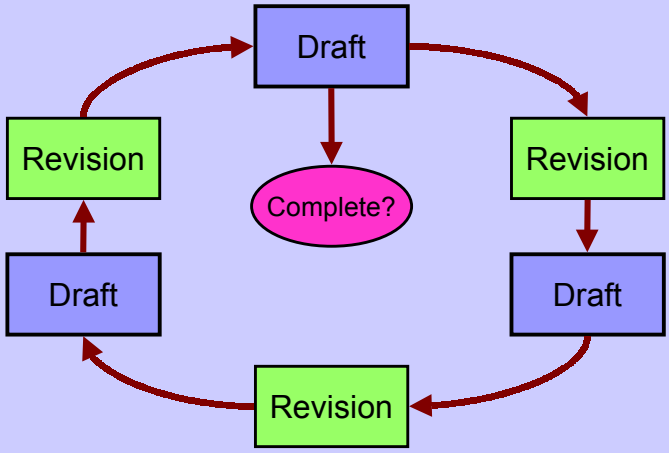
SC4 Development Process (View #2)



SC4 Development Process (View #3)



SC4 Development Process (View #4)



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What documents do we need?

- ISO/IEC Directives
  - Requirements and guidelines that apply to all ISO and IEC standardization work
- SC4 Standing Documents
  - Requirements and guidelines that apply to all SC4 projects
  - Requirements and guidelines that apply to specific types of SC4 project

ISO/IEC Directives

- Part 1: Procedures for the technical work
- Part 2: Methodology for the development of International Standards
- Part 3: Rules for the structure and drafting of International Standards

Changes to ISO/IEC Directives

- New Part 1
  - Includes procedures for TS and PAS documents
  - Omission of FDIS (approval) ballots
  - Justification of NWI proposals

Changes to ISO/IEC Directives (continued)

- New Part 2
  - Replaces old Parts 2 and 3
  - Includes requirements for TS and PAS documents
  - Minor changes to some boilerplate text
- No surprises!
  - SC4 was aware of and following new requirements based on information from ISO TMB and ISO CS

SC4 Standing Documents

- Procedural
  - SC4 Organization Handbook
  - SC4 Quality Manual
- Describe the overall process and procedures for developing a standard in SC4
  - Supplement and interpret ISO/IEC Directives Part 1 for use in SC4

SC4 Supplementary Directives

- Originally “Supplementary Directives for the Drafting and Presentation of ISO 10303”
  - developed to support “initial release” work on STEP
- Now “SC4 Supplementary directives - Rules for the structure and drafting of SC4 standards for industrial data”
  - supplement and interpret ISO/IEC Directives Part 3:1997 for use in SC4

Supplementary Directives - Contents

1. Scope
2. Normative references
3. Terms and definitions
4. Requirements for the structure and content of SC4 standards
5. Format and layout of SC4 standards
6. EXPRESS presentation style

Supplementary Directives - Contents (continued)

7. Documentation of STEP IRs
8. Documentation of STEP AICs
9. Documentation of STEP APs
10. Documentation of STEP ATSs
11-17: Placeholders for requirements specific to other SC4 standards

Annexes

Supplementary Directives status (Funchal)

- SC4 N858 - draft second edition of the Supplementary Directives, circulated for Standing Document ballot in 1999
- Several QC documents that revise/supplement N858:
  - Standing document issues log (QC N132)
  - Changes resulting from issue resolution (QC N138)
  - Guidance on use of ASN.1 identifiers (QC N171)
  - Detailed changes to the Supplementary Directives (QC N180 - 10th in a series of such documents)

Supplementary Directives status (San Francisco)

- A final draft of the new SDs has been circulated to QC and WG Conveners (QC N192)
  - some editorial and minor technical comments submitted
- Updated version will be published immediately after this meeting (QC N200)
  - recommendation for immediate use by all projects
  - 4-week review by QC / conveners / project teams
  - final publication in August

STEP-specific Standing Documents

- Guidelines for application interpreted construct development
- Guidelines for application interpreted model development
- Guidelines for the development and approval of STEP application protocols

STEP-specific Standing Documents

- Guidelines for the development of abstract test suites
  - Second edition was balloted in 1999
  - No resources to complete for publication
- Guidelines for the development of mapping specifications
  - Replaces *Guidelines for the development of mapping tables*

Guidelines for modules

- Documents out for SC4 Ballot
  - N1114 Application module development points within the application protocol development process
  - N1113 Guidelines for the content of application modules
  - N1161 Guidelines for the content of application protocols that use application modules

What about using XML/HTML?

- New Supplementary Directives have been structured with support for HTML in mind
  - All presentation and layout requirements in one place (clause 5)
- Joint QC/WG3 meeting this week

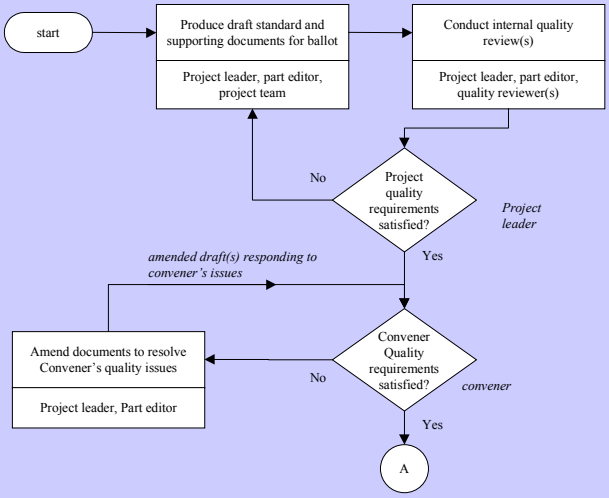
Checklists

- Driven by requirements of QC *Procedures for internal review* and the SC4 Quality Manual
  - part of QC transition from external assessment and approval of documents to projects being responsible for their own part quality

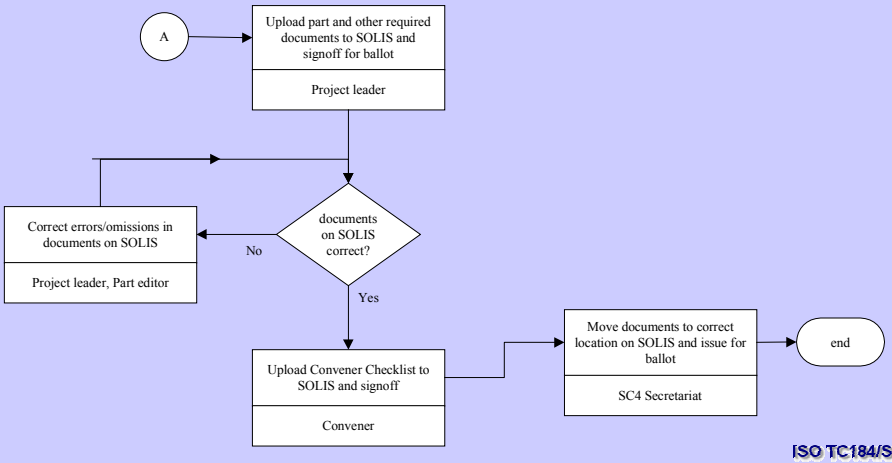
Checklists (continued)

- Internal review checklist
  - completed by a team member responsible for quality (preferably not the project leader or part editor)
  - ensures a thorough validation of the part against ISO and SC4 requirements
- Project leader checklist
- Convener checklist

Review and approval procedure



Review and approval procedure (continued)



Conclusions

- SC4's quality system is based on a number of key documents that describe how to develop a standard, and the required characteristics of a standard
  - ISO/IEC Directives
  - SC4 Standing Documents
- The Quality Committee can provide help to projects on understanding and using these documents

Sources of information

- "Necessary documents" page on SOLIS
  - http://www.nist.gov/sc4/www/necsdocs.htm
  - not fully up to date, some links are broken
  - should be corrected immediately after this meeting
- PDT Solutions QC pages
  - http://www.pdtsolutions.co.uk/standard/qc
- SCRA have offered to host and manage information for the QC

Questions / discussion

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Drafting a Standard

Julian Fowler
PDTSolutions
jfowler@pdtsolutions.co.uk

Thomas L. Warren
Director, Technical Writing Program
Oklahoma State University
Stillwater, OK 74078
twarren@okstate.edu

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Plan for the Day

- **Presentation on new *ISO Directives* and new *Supplementary Directives***
- **Break**
- **Presentation on writing a draft**

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Drafting a Standard: Overview

- **Analyzing users**
- **Cohesion and Coherence**
- **Conclusion and suggestions**

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Analysis of Users

- **The most important part of writing**
- **Users**
  - ✓ **Come to your document for information**
  - ✓ **Different users have different goals**
- **Typically**
  - ✓ **Have not taken part in developing document**
  - ✓ **Are not working with authors/editors**
  - ✓ **Do not know what you know**

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Analysis of Users, cont.

- **Categories to use when analyzing**
  - ✓ **Education (formal)**
  - ✓ **Purpose in reading**
  - ✓ **Style to use**

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User's Education

- **Assumed years of formal education and degrees**
- **Knowing determines comfort level with**
  - ✓ **Vocabulary—to define or not**
  - ✓ **Concepts—to give examples or not**
  - ✓ **Sentence and paragraph structure**

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User's Purpose

- **Why is the user reading?**
  - ✓ **Trying to decide about applying material?**
  - ✓ **Learn how to apply material?**
  - ✓ **Determine accuracy of material?**
- **All users have information goal(s)**

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Style to Use

- **Education suggests ability to process**
  - ✓ **Level of sentence and paragraph complexity**
  - ✓ **Percentages of structural types**
    - ➢ **Simple**
    - ➢ **Complex**
    - ➢ **Compound**
    - ➢ **Compound,complex**
- **Level and types of words**

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Summary of Style to Use

ITEM	EXEC	TECH	EXP
Wds/Sent	17	→	25+
Wds/Para	100	→	150+
Sent/Para	6	→	6+
% Sent Structure	Simple (85%)	→	Complex (<85%)

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Type of Users

- **Different types of users of standards documents**
  - ✓ **Executive**
  - ✓ **Technician**
  - ✓ **Expert**

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Executive

- Decision-makers
  - ✓ Proceed with work described in document?
- College/university degree(s)
- Been out of technical field for a while doing executive things
- Needs to be convinced to adopt

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Executive, cont.

- Must persuade based on . . .
  - ✓ how the standard applies to the company's needs and goals
    - ➢ WRITER'S ISSUE: Where do you show application?
  - ✓ the relevance of the standard as shown through examples and applications
    - ➢ WRITER'S ISSUE: What are the sources of examples and applications?

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Technician

- Entry-level professional
- Schooling “knowledge”
- Limited work place “knowledge”
- Doers in organization
- May supervise others
- Needs practical applications

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Expert

- Advanced degrees or extensive experience
- Interested in theory
- Checking accuracy and relevance of content to situation
- Needs special terms only defined

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Summary of Reading Goals

- **Executive must find. . .**
  - ✓ **relevance to situation**
- **Technician must find . . .**
  - ✓ **practical applications**
- **Expert must find . . .**
  - ✓ **theory**
  - ✓ **accuracy**

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How are User's Goals Met?

Reader Type	Build into text	Extend from text	Infer from text
Executive			X
Technician		X	
Expert	X		

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Sections of Typical Draft

- **Preliminary**
  - ✓ **Preface**
  - ✓ **Introduction**
- **Normative: General**
  - ✓ **Scope**
  - ✓ **Terms (Definitions of clause 3)**
- **Normative: Technical**
  - ✓ **Technical content and specifications**

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Where do Readers Find the Information They Need?

User	Preliminary Elements	Normative: General		Normative: Technical	Annex
		Scope	Terms		
Exec	X	X			
Tech		X	X	X	X
Expert	X	X	X	X	X

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How do You Make the Draft Readable?

- **Coherence**
- **Cohesion**

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Coherence and Cohesion*

- **Coherence**
  - ✓ **Gives consistent focus to paragraph**
  - ✓ **Consistency of topics**
- **Cohesion**
  - ✓ **Sentences are logically connected**
  - ✓ **Following sentence is forecasted in preceding sentence**

***For a more detailed discussion, see WILLIAMS, J. Style: ten lessons in clarity and grace, 6th ed., NY: Longmans**

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Coherence

- **GRAMMAR REVIEW:**
  - ✓ ***Subject*** **of the sentence is what performs the action expressed in the verb—the actor**
  - ✓ ***Verb*** **is word that conveys action and time**
  - ✓ ***Object/complement*** **is the goal of the action of the verb**

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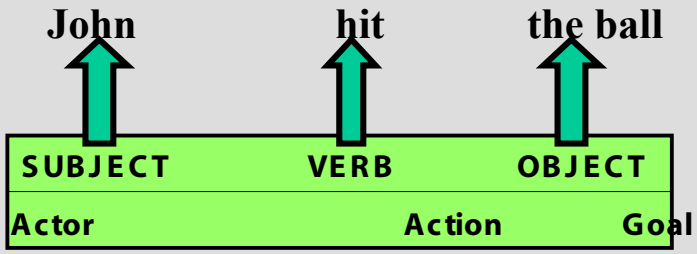
Example



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Coherence, cont.

- We have the three components of the sentence (subject, verb, object)
- What can we deduce about the user's information need?
  - ✓ User must know about *John*—no explanation = OLD INFORMATION
  - ✓ User does not know what *John* did—explanation = NEW INFORMATION

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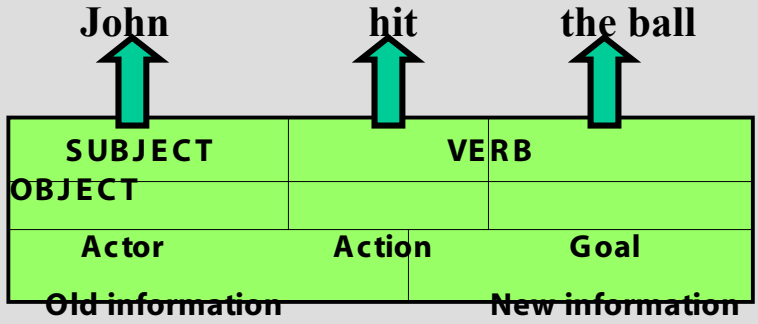
Example Updated



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Coherence, cont.

- **Consider what the next sentence is to be:**
  - ✓ **John (or He) ran to first base.**
  - ✓ **The ball went over the fence.**

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Charting those Possibilities

John	hit	the ball
He	ran	to first base
The ball	went	over the fence

SUBJECT	VERB	OBJECT
OLD INFORMATION		NEW INFORMATION

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Comparison

BEGINNING	VERB	REST
John	hit	the ball
The ball	went	over the fence

BEGINNING	VERB	REST
John	hit	the ball
He	ran	to first base

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Comparison

BEGINNING	VERB	REST
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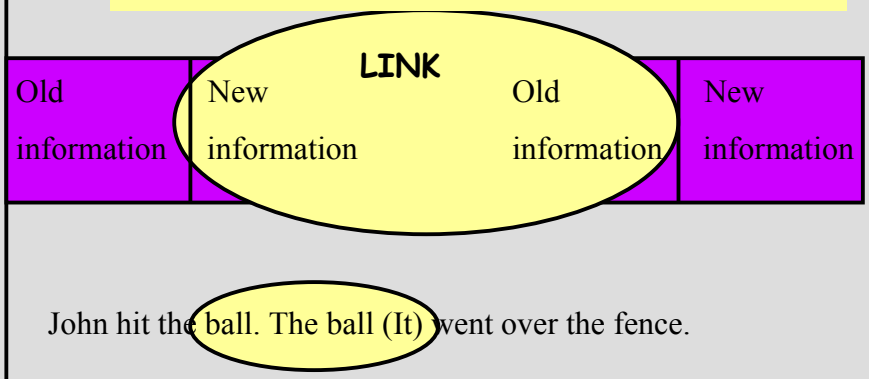
Pattern for Coherence



John hit the ball. The ball (It) went over the fence.

The sentences cohere.

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Advantages

- **The connection between the two sentences relies on wording, so it is direct**
  - ✓ **Repetition (if *The ball* is used)**
  - ✓ **Pronoun (If *it* is used)**
- **The sentences build on what the reader already knows**
- **Maintains logical flow between sentences**

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Suggestions

- **Begin sentences with ideas users will recognize**
- **End sentences with information that is new to the user**

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Cohesion

- **Relates to a different kind of logical consistency**
- **Look at our examples again:**

John hit the ball. It went over the fence.

Now what?

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And the next sentence

John hit the ball. It went over the fence. That home run won the game for John's team

Can we still say that we have COHESION?

Yes. *That homerun* builds on an inference from the previous sentence (ignoring the possibility that the ball was foul). Balls hit in fair ground over the fence on the fly are *home runs.* So, we still have cohesion. But notice the beginnings of each sentence.

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Sentence beginnings

- ***John***
- ***It***
- ***That home run***

- **Three sentences, three different subjects, three topics**

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Cohesion

- **Cohesion**
  - ✓ **the logical consistency of the things being talked about in the sentences**

~~NOTE: The topics of the sentences are not~~ necessarily in the subject slot

The proposers of a New Work Item Proposal (NWIP) shall prepare a quality plan and include it as part of the documentation supporting the NWIP. The convener of the Working Group to which the project is allocated shall review each project's quality plan when the project is approved. The convener shall ensure that the quality plan meets the requirements defined in this quality manual, and may recommend any changes to the quality plan that will improve the efficiency or effectiveness of the project.

MAIN STATED SUBJECTS OF SENTENCES

- The proposers
- The convener
- The convener

Appears to be Consistent

The proposers of a New Work Item Proposal (NWIP) shall prepare a quality plan and include it as part of the documentation supporting the NWIP. The convener of the Working Group to which the project is allocated shall review each project's quality plan when the project is approved. The convener shall ensure that the quality plan meets the requirements defined in this quality manual, and may recommend any changes to the quality plan that will improve the efficiency or effectiveness of the project.

ACTUAL SUBJECTS/TOPICS OF ALL CLAUSES

CLAUSE 1	CLAUSE 2	CLAUSE 3
#1 The proposers	[the proposers]	
#2 The convener	project	project
#3 The convener	plan [the convener]	[they] that

Consistency problem?

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Coherence/Cohesion: Here's the Point—1

- **Cohesion most important**
- **Sentences must "hang together"**

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Coherence/Cohesion: Here's the Point—2

- **Sentence beginnings are to be familiar to your reader = Old Information**
- **Sentence endings are to be unanticipated by your reader = New Information**

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Coherence/Cohesion: Here's the Point—3

- **Two things contribute to cohesion:**
  - ✓ **Identity of topics quickly and easily seen**
  - ✓ **Strings of topics "hang together"**
- **String of topics must seem to constitute a related set**

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Coherence/Cohesion: Here's the Point—4

- **If you begin with the same words for topics and in same position—**
  - ✓ **reader will think you are TOO consistent; so. . .**
  - ✓ **revise:**
    - ➢ **use pronouns**
    - ➢ **move topic into prepositional phrase**
    - ➢ **paraphrase topic**
    - ➢ **don't change topics too often**

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Definitions of Old and New Information

- **Writers (and editors) must realize that what is old for one reader may be new for another**
- **That means that each section must be written differently for different readers**

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Suggestions

- **Know specifications for document**
  - ✓ From ISO and SC4
  - ✓ What the user expects
- **Understand how drafts are written**
  - ✓ Content
  - ✓ Creating text
- **Plan revisions/reviews for expression as carefully as revisions/reviews for content**

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Suggestions, cont.

- **When revising,**
  - ✓ **Keep sentences cohesive by**
    - ➢ **beginning sentences with ideas users will recognize, and**
    - ➢ **ending sentences with information that is new to the user**
- **Keep paragraphs coherent by using**
  - ✓ **consistent topics**
  - ✓ **strong transitions**

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Resources

- *ISO Directives, Parts 1 and 2*
- *SC4 Supplementary Directives* (SC4 N858; New ones: QC N192/200)
- *SC4 Quality Manual* (SC4 N1110)
- *Checklists*
  - ✓ *Internal Review* (QC N193)
  - ✓ *Project Leader* (QC N194)
  - ✓ *Convener* (QC N195)

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Resources, cont.

- THOMPSON, Della, ed. The concise Oxford dictionary of current English, 9th edition.
- ALRED, Gerald, and others. Handbook of technical writing, 6th edition.
- WILLIAMS, Joseph M. Style: ten lessons in clarity and grace, 6th edition

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Resources, cont.: ISO

- ***ISO 27*—Units for quantities**
- ***ISO 31*—Symbols for quantities**
- ***ISO 639.* Names of languages**
- ***ISO 10241.* Defining terms**
- ***ISO 3166.* Country Codes**

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Questions and Comments

Definitions in SC4 Standards

Julian Fowler (PDT Solutions)
Tom Warren (Oklahoma State University)

Definitions

- Defining *defining*
  - Places limits
  - "determine the limits of; state exactly what (a thing) is". It is related to *definite* = "having fixed limits" (Oxford dictionary of English etymology)
  - "**1** give the exact meaning of (a word, etc.). **2** describe the scope of (*define one's position*). **3** make clear, esp. in outline (*well-defined image*). **4** mark out the boundary or limits of." (Concise Oxford, 9th ed.)

Kinds of Definitions

- Ostensive (point to an *X*)
- Synonymous (*X* is like *Y*)
- Negative (*X* is not a *Y*)
- Paired (*X* is a *Y*: *XZ* is *X* and *Z* because *XZ* is known)
- Etymology/Semantic (*X* derives from *WXY*)
- Classical (what ISO uses)

Classical Definition

- Types
  - Consensual
  - Legislative
  - Stipulative (what ISO uses)

Consensual Classical Definition

- Most common meaning for the word
- Most people agree on meaning
- Typically, find in a dictionary (connotative meaning)
- In common agreement even if not in dictionary

Legislative Classical Definition

- What the term *ought* to mean
- Consensual meaning could be wrong for the context used
- Author/editor wants to change the definition

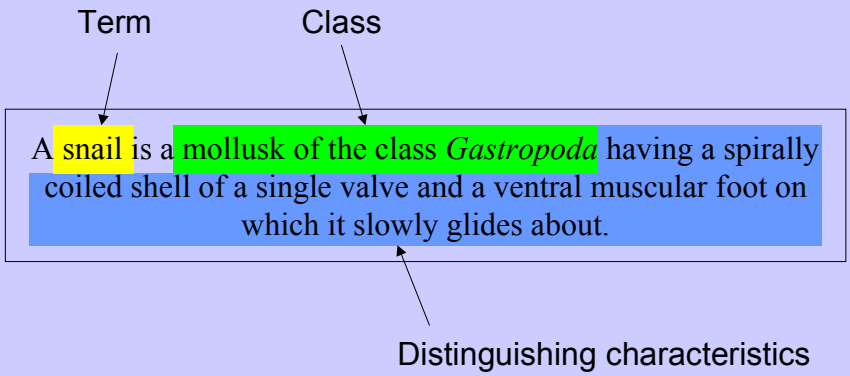
Stipulative Classical Definition

- Used in ISO
- Author/editor stipulates the meaning of the word
- "In this text, *WORD* means . . . ."
- Usually give special meanings not normally found

Parts of Classical Definition

- Three parts
  - Term being defined (*species*)
  - The class the term belongs to (*genus*)
  - The characteristics that distinguish the term from other terms in the class (*differentia*)

Example



Characteristics of Classical Definition

- You can substitute parts of the sentence and the sentence will still make sense (See Example 1)
- Another characteristic is that the two parts of the definition are interchangeable (with suitable modification of the verb) (See Example 2)

Example 1 (clause 3 type)

3.x.y
hero
person who is useful to society

(Here, *hero* is the term, *person* is the class, and *useful to society* shows how this kind of person differs from other kinds of persons.)

And so . . .

The *hero* rescued the kitten.

is the same as

The *person useful to society* rescued the kitten.

Example 2

The kitten was rescued by the person useful to society.

Consider these definitions ...

A human is a rational being

You can easily exchange the parts to get *A rational being is a human*. Thus, you have what can be called an *essential definition* because it is true and makes sense.

In addition, we have discovered the essence of the term we are trying to define

But ...

To define a human as a *biped animal* does not get to the essence of the term.

We cannot reverse the definition and still maintain "truth" as we did before: *A biped animal is a human.*

Consider ...

A product is a thing or substance produced by a natural or artificial process.

Is that the same as . . . .

A thing or substance produced by a natural or artificial process is a product.

?????

Circular Definitions

- The word being defined appears in the definition.

Spontaneous combustion is fire that begins spontaneously.

Term Class Distinguishing characteristics

Spontaneous combustion is the self-ignition of a flammable material through chemical reaction.

Definitions in SC4 standards

- Definitions of terms
  - clause 3 of any standard
- Definitions of application objects
  - clause 4.2 of STEP APs, STEP AMs
- Definitions of EXPRESS entity data types
  - all standards that include EXPRESS schemas
- Definitions of activities and information flows
  - annex F of STEP APs

Definitions of terms

- "definitions necessary for the understanding of certain terms used in the standard"
  - ISO/IEC Directives, Part 3
- Terms that are needed to state requirements or explain the subject matter of the standard, but:
  - are not defined in the COED
  - have multiple definitions in the COED, of which only one is relevant
  - are not defined in other standards

What is a definition in clause 3 defining?

- A clause 3 definition asserts the meaning of a word or phrase, such that the word or phrase has that meaning when it is used in the standard
- These are *lexical* definitions, as would be found in a dictionary or a terminology standard

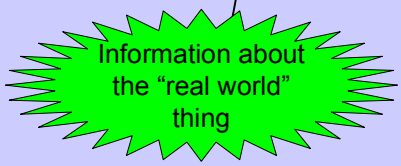
Example of a clause 3 definition

3.1.1
foojer
wiffer (see 3.1.3) that has additional supporting uflers (see 3.1.2)

- This tells us that each time we encounter the word “foojer” in the text, we can substitute the phrase “wiffer that has additional supporting uflers”
- Also, the reader *understands* what a foojer is, based on the supplied definition

Application objects

- “atomic element that embodies a unique application concept and contains attributes that specify the data elements that the object comprises”
  - definition from ISO 10303-1



Definitions of application objects

- Application objects (“ARM entities”) in STEP APs are more than definitions of terms:
  - identify some thing of interest within the application domain
  - define or confirm the term used to refer to this thing
  - possibly, position this thing within a classification system
  - possibly, identify the data that domain experts and applications use to communicate information about the thing.

Example

Is the referent a “real world” object, or an information object that represents the “real world” thing?

4.2.261 Item

An Item is either a single object or a unit in a group of objects. It collects the information that is common to all versions of the object.

NOTE An Item may be either a single piece part, an assembly of arbitrary complexity, a raw material, or a tool.

EXAMPLE In the context of cars, an Item may be the car as whole, the assembly of an engine, the car body, a fender, the side window glass, grease, or a stamping die.

4.2.383 Product_component

A Product_component is an element in a conceptual product structure.

NOTE 1 A product_component may, by intent, be generic to enable specializations. One or more distinct items identified from such a Product_component by adding specified characteristics.

NOTE 2 A Product_component is a mechanism for collecting the knowledge a company has accumulated during the design of similar products.

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Example

What kind of reader is going to understand this?

Who is this part of the document aimed at?

4.2.261 Item

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Examination/analysis of the rest of the document shows that these are classes - not stated in the definition!

Definitions of entity data types

- The definition of an entity data type shall state clearly the following:
  - the concept that the entity data type represents;
  - the information about the concept that is represented in the data structure and constraints defined by the entity data type.

Definitions of entity data types

- The name of the entity data type without underscore and in normal text (not boldface) may be used to stand for the concept that the entity data type represents.
- In SC4 standards, we often use a shorthand:
  - an **<entity_data_type_name>** is/represents … is substituted for:
  - an instance of the **<entity_data_type_name>** entity data type is/represents …".

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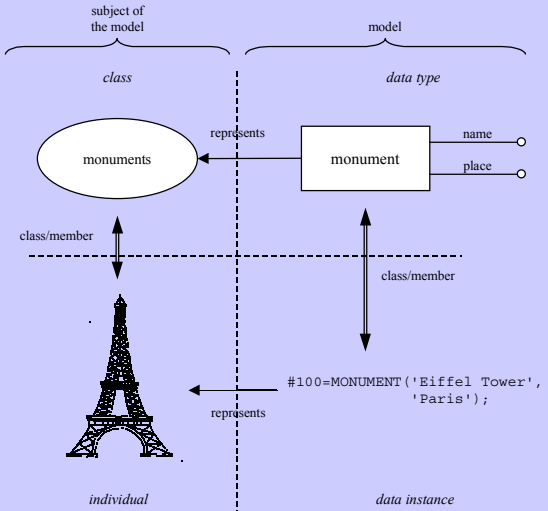
Check what the definition refers to



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Using defined terms in entity data type definitions

Clause 3 definition

3.x.y
product
thing or substance produced by a natural or artificial process

Entity data type definition

5.p.q product

- A **product** is a product.
- A **product** is a thing or substance produced by a natural or artificial process.
- An instance of the **product** entity data type presents a product.
- An instance of the **product** entity data type presents a thing or substance produced by a natural or artificial process.

Using defined terms as entity data type names

- Do not use defined terms as entity data type names unless a statement of the following form is true:

5.p.q product

- A **product** is a product.

So, what about:

5.4.1 product

- A **product** represents a product or a type of product (see 3.3.4).

Conclusions

- Definitions are a key to understandability, clarity, and lack of ambiguity in a standard.
- Link the terms and concepts used in the standard to those understood by the reader and/or defined in the dictionary.
- Note the different requirements for different type of definition.

Suggestions for Writing Definitions for ISO Documents

- Words used in definitions must be clearer and more familiar to the user than the term itself.
- Definition should not repeat the term to be defined or use synonymous or derivative terms.
- State the definition positively whenever possible, not negatively.
- Refer to *ISO Directives* annexes C.1, C.2, and C.3, ISO 10241, and Annex B of the *SD*s.

Questions / discussion